

National Aeronautics and Space Administration



January 15, 2012

Heliophysics

Science Mission Directorate
Division Overview
February 27, 2012
Dr. Barbara Giles

NASA SMD Heliophysics Division

What's Changed, What's the Same

Changed:

- Heliophysics Director retired, Richard Fisher
- New Heliophysics Director appointed, Barbara Giles
- Geospace Discipline Scientist retired, Mary Mellott
- Geospace IPA at an end, Charles Goodrich
- Geospace IPA onboarding, Elsayed Talaat
- Lead Secretary retired: Shelia Brown
- STP/MMS Program Scientist: Dennis Gallagher, MSFC
- Heliophysics Executive Secretary: Dennis Gallagher, MSFC
- Explorer Program Scientist: Jeffrey Newmark, SMD
- Heliophysics Strategic Planning: Jeffrey Newmark, SMD
- Lead Secretary: Gloria Stewart

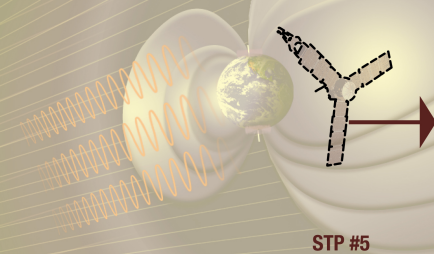
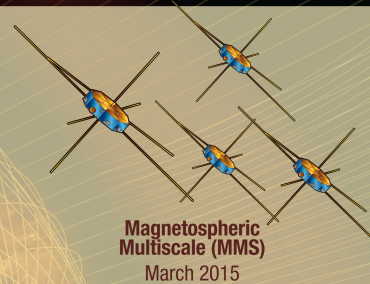
Same:

- Most everything else ... “let's keep the wings level, folks”.

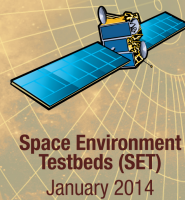
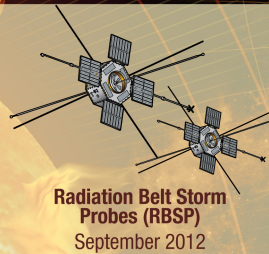
The division has begun a year-long Organization Development activity to support the onboarding of a new division director.

Heliophysics Program 2012-2018

Solar Terrestrial Probes



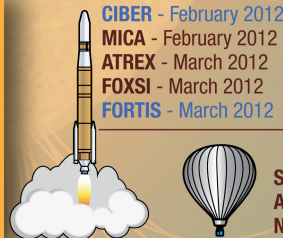
Living With a Star



Explorers



Research Program



Ongoing

Heliophysics Missions
Astrophysics Missions

2012

2013

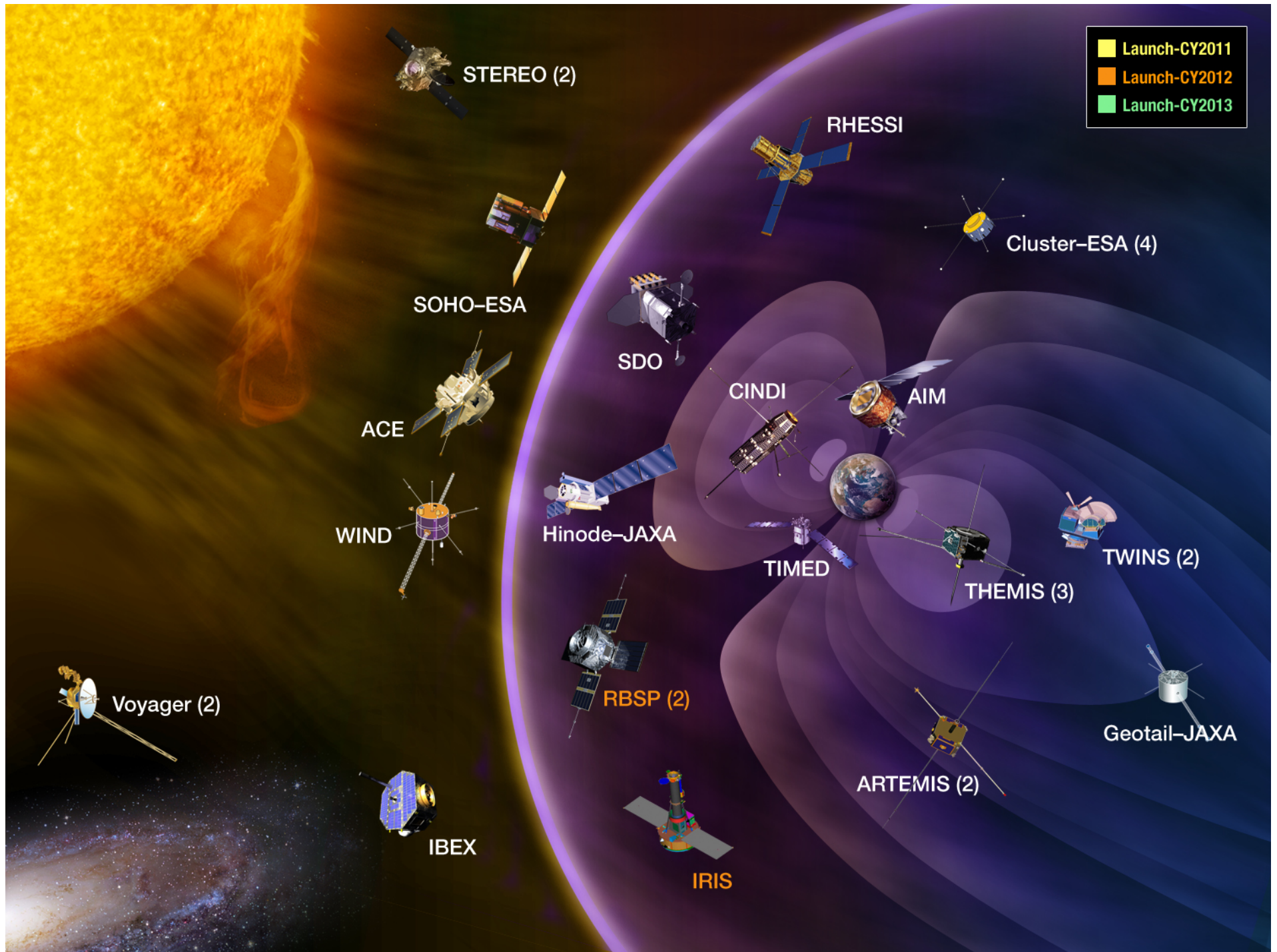
2014

2015

2016

2017

2018



Major Recent Accomplishments - Science

- **Imaged in 3D the first X-class solar flares and coronal mass ejections (CME) of new Solar Cycle 24** with unprecedented resolution in space, time, and wavelength, providing crucial data for improved space weather forecasting models.
- **Tracked a solar storm all the way from the Sun to Earth.** This first-time observation revealed the magnetic underpinnings of the CME, showed us how CMEs evolve in transit, and produced dramatic footage of the storm cloud engulfing Earth.
- **Discovered that Earth's atmosphere extends farther into space than previously thought.** Nine seasons of Polar Mesospheric Cloud monitoring, shows that all layers of Earth's atmosphere—even distant layers like the thermosphere, ionosphere and plasmasphere—are coupled to the weather and climate of our Earth below.
- **Discovered "magnetic bubbles" at the edge of the Solar System and "alien matter" inside.** The IBEX spacecraft detected atoms from interstellar space penetrating the inner solar system: the chemistry of the Solar System appears to be different from the space outside. Meanwhile, the Voyagers detected a froth of vast magnetic bubbles at the edge of the heliosphere: these bubbles help protect us from cosmic rays.
- **Developed a new Interplanetary Space Weather forecasting service** for researchers, spacecraft operators, and members of the general public. A joint effort with NSF, DOD, and NOAA, the service tracks solar storms throughout the solar system and is available 24/7 on the Internet.

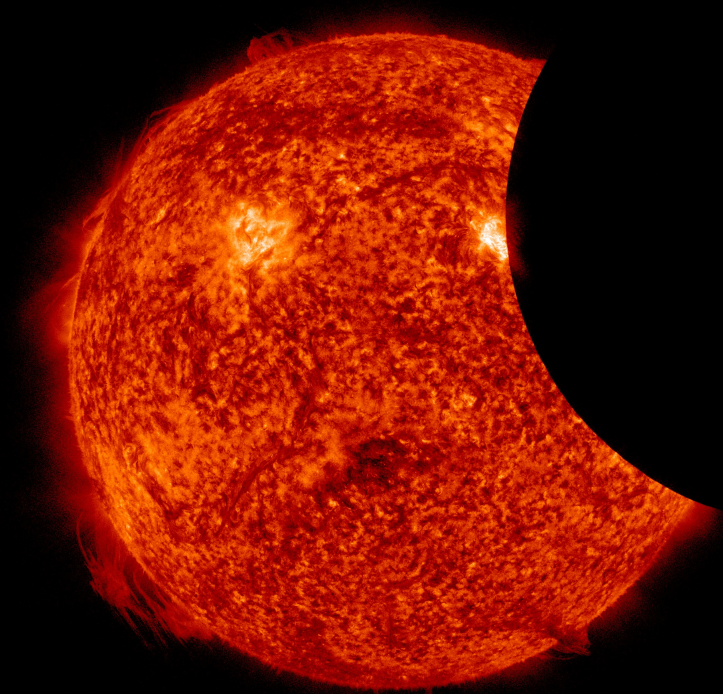
Major Recent Accomplishments - Flight

- **Advanced the Radiation Belt Storm Probe mission toward a September 2012 launch.** All instruments have been delivered and the project completed its pre-environmental review and is starting thermal-vac testing
- **Completed a major review (CDR) for IRIS.** IRIS uses a solar telescope and spectrograph to examine the solar chromosphere, a layer considered to be the genesis-zone of solar flares.
- **MMS successfully completed testing Engineering Test Units and started fabrication of flight units.**
- **Achieved key milestones in developing the ESA-NASA Solar Orbiter mission** to explore the inner heliosphere, including Phase A formulation activities and approval to start Phase B.
- **Successfully advanced Solar Probe Plus**, a mission to fly through the atmosphere of the sun. Completed Phase A formulation activities and approved to start Phase B.
- **The BARREL project conducted its second test campaign** in Antarctica and delivered the first of 40 balloon flight payloads.
- **Successfully completed 12 suborbital launches**, supporting 5 science investigations, 1 technology demonstration, 2 test flights, and 3 educational projects.
- **Wallops Range provided services** for 3 Space Shuttle missions, SpaceX, DoD Space-1 mission, and supported commissioning of the Taurus-II Horizontal Integration Facility.

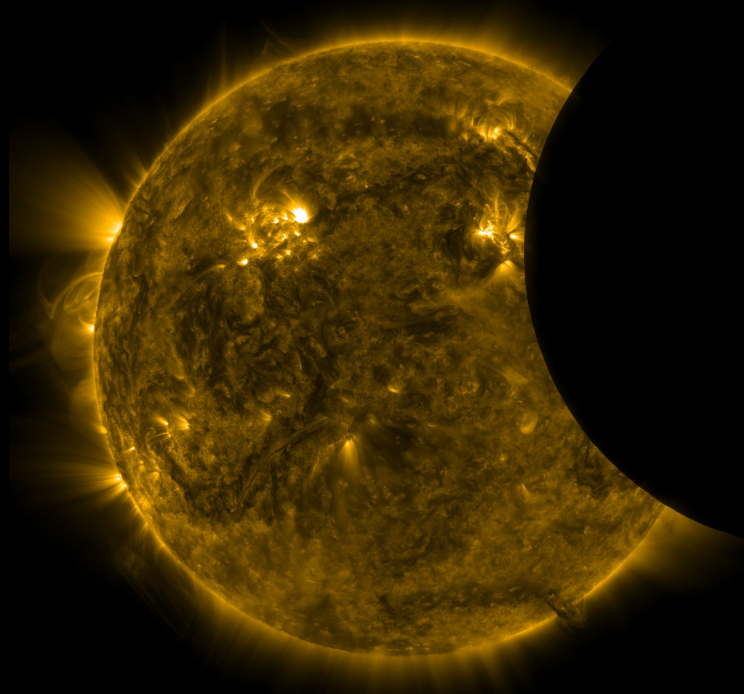
SDO in-flight calibration opportunity

On Feb 21, the new Moon passed in front of the sun producing a partial solar eclipse for the SDO spacecraft.

The sharp edge of the lunar limb are used to measure in-orbit characteristics of the telescope – e.g., how light diffracts around the telescope's optics and filter support grids. Once calibrated, the additional instrumental effect corrections are applied to the SDO data sharpening the images even more than before.



SDO/AIA 304 2012-02-21 13:58:02 UT



SDO/AIA 171 2012-02-21 14:11:15 UT

FY 2013 SMD Program/Budget Strategy

- Continue to provide the most productive Earth & space science program for the available resources
 - Guided by national priorities
 - Informed by NRC Decadal Surveys recommendations
- Continue to responsibly manage the national investment in robotic space missions
 - Confirm new missions only after sufficient technology maturation and budgets at an appropriate confidence level
 - Closely manage JWST to the new cost and schedule baseline
- Plan and conduct a new Mars program with other NASA organizations to meet both human exploration and science goals
- Adequately budget for launch services acquired for SMD by NASA's Launch Services Program (LSP):
 - Availability and reliability for medium class
 - Encourage cost constraining measures for intermediate/large class

Science Budget Request Summary

	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	FY 17
Science	\$4,919.7	\$5,073.7	\$4,911.2	\$4,914.4	\$4,914.4	\$4,914.4	\$4,914.4
<u>Earth Science</u>	<u>\$1,721.9</u>	<u>\$1,760.5</u>	<u>\$1,784.8</u>	<u>\$1,775.6</u>	<u>\$1,835.5</u>	<u>\$1,826.2</u>	<u>\$1,772.8</u>
Earth Science Research	\$461.1	\$440.1	\$433.6	\$461.7	\$485.1	\$497.3	\$508.1
Earth Systematic Missions	\$841.2	\$881.1	\$886.0	\$787.6	\$813.2	\$835.6	\$756.4
Earth System Science Pathfinder	\$182.8	\$188.3	\$219.5	\$270.9	\$275.6	\$224.2	\$234.4
Earth Science Multi-Mission Operat	\$147.4	\$163.4	\$161.7	\$170.2	\$172.9	\$176.5	\$177.6
Earth Science Technology	\$52.8	\$51.2	\$49.5	\$50.1	\$52.1	\$54.1	\$56.1
Applied Sciences	\$36.6	\$36.4	\$34.6	\$35.0	\$36.7	\$38.4	\$40.1
<u>Planetary Science</u>	<u>\$1,450.8</u>	<u>\$1,501.4</u>	<u>\$1,192.3</u>	<u>\$1,133.7</u>	<u>\$1,102.0</u>	<u>\$1,119.4</u>	<u>\$1,198.8</u>
Planetary Science Research	\$158.8	\$174.1	\$188.5	\$222.5	\$233.4	\$231.7	\$230.3
Lunar Quest Program	\$130.2	\$139.9	\$61.5	\$6.2			
Discovery	\$192.0	\$172.6	\$189.6	\$242.2	\$235.6	\$193.8	\$134.3
New Frontiers	\$213.2	\$160.7	\$175.0	\$269.8	\$279.6	\$259.9	\$155.1
Mars Exploration	\$547.4	\$587.0	\$360.8	\$227.7	\$188.7	\$266.9	\$503.1
Outer Planets	\$91.9	\$122.1	\$84.0	\$80.8	\$78.8	\$76.2	\$76.3
Technology	\$117.3	\$144.9	\$132.9	\$84.6	\$85.9	\$90.9	\$99.6
<u>Astrophysics</u>	<u>\$631.1</u>	<u>\$672.7</u>	<u>\$659.4</u>	<u>\$703.0</u>	<u>\$693.7</u>	<u>\$708.9</u>	<u>\$710.2</u>
Astrophysics Research	\$146.9	\$164.1	\$176.2	\$189.1	\$205.1	\$211.5	\$218.7
Cosmic Origins	\$229.1	\$237.3	\$240.4	\$228.5	\$215.1	\$205.3	\$205.7
Physics of the Cosmos	\$108.7	\$108.3	\$111.8	\$109.6	\$96.3	\$92.7	\$74.6
Exoplanet Exploration	\$46.4	\$50.8	\$56.0	\$41.6	\$43.3	\$42.4	\$45.6
Astrophysics Explorer	\$100.0	\$112.2	\$75.1	\$134.3	\$133.9	\$157.0	\$165.6
James Webb Space Telescope	\$476.8	\$518.6	\$627.6	\$659.1	\$646.6	\$621.6	\$571.1
<u>Heliophysics</u>	<u>\$639.2</u>	<u>\$620.5</u>	<u>\$647.0</u>	<u>\$643.0</u>	<u>\$636.7</u>	<u>\$638.3</u>	<u>\$661.6</u>
Heliophysics Research	\$160.8	\$175.2	\$178.9	\$162.6	\$168.5	\$170.3	\$171.6
Living with a Star	\$218.4	\$196.3	\$232.6	\$212.2	\$286.2	\$336.6	\$351.7
Solar Terrestrial Probes	\$168.3	\$188.7	\$189.4	\$179.8	\$64.5	\$46.7	\$53.4
Heliophysics Explorer Program	\$91.7	\$60.2	\$46.1	\$88.4	\$117.5	\$84.8	\$84.8
New Millennium	\$0.1						

FY 2014-FY
2017 estimates
are notional

* FY11-12 do not
match Op Plans
exactly –
rescission of
\$5.2M is shown
against FY12,
not FY11

Science FY12-13 Budget Changes

	FY 12	FY 13	Comments
Science	\$5,073.7	\$4,911.2	reflects current budget environment
<u>Earth Science</u>	<u>\$1,760.5</u>	<u>\$1,784.8</u>	
Earth Science Research	\$440.1	\$433.6	
Earth Systematic Missions	\$881.1	\$886.0	
Earth System Science Pathfinder	\$188.3	\$219.5	Venture Class missions ramping up as planned
Earth Science Multi-Mission Operations	\$163.4	\$161.7	
Earth Science Technology	\$51.2	\$49.5	
Applied Sciences	\$36.4	\$34.6	
 <u>Planetary Science</u>	 <u>\$1,501.4</u>	 <u>\$1,192.3</u>	
Planetary Science Research	\$174.1	\$188.5	
Lunar Quest Program	\$139.9	\$61.5	Winding down after LADEE launch in 2013
Discovery	\$172.6	\$189.6	
New Frontiers	\$160.7	\$175.0	OSIRIS-REx ramping up for 2016 launch
Mars Exploration	\$587.0	\$360.8	MSL launched November 2011; new program strategy
Outer Planets	\$122.1	\$84.0	Flagships deferred; Cassini and low-level studies continue
Technology	\$144.9	\$132.9	
 <u>Astrophysics</u>	 <u>\$672.7</u>	 <u>\$659.4</u>	
Astrophysics Research	\$164.1	\$176.2	
Cosmic Origins	\$237.3	\$240.4	
Physics of the Cosmos	\$108.3	\$111.8	
Exoplanet Exploration	\$50.8	\$56.0	
Astrophysics Explorer	\$112.2	\$75.1	NuSTAR launch in FY12; next selection early FY13
 James Webb Space Telescope	 \$518.6	 \$627.6	 As per rebaselined program requirements for 2018 LRD
 <u>Heliophysics</u>	 <u>\$620.5</u>	 <u>\$647.0</u>	
Heliophysics Research	\$175.2	\$178.9	
Living with a Star	\$196.3	\$232.6	Solar Probe Plus ramping up
Solar Terrestrial Probes	\$188.7	\$189.4	
Heliophysics Explorer Program	\$60.2	\$46.1	IRIS launch late 2012; next selection early FY13

Astrophysics
Earth Science
Heliophysics
Planetary Science

Total Missions / Spacecraft
86 / 98

2/13/12

Formulation
11 / 11

Implementation
15 / 18

Primary Ops
14 / 14

Extended Ops
46 / 55

JPL 2	GSFC 7	MSFC 1	LaRC 1	ARC 1	JPL 3	GSFC 9/13	DFRC 1/0	MSFC 1	ARC 1	JPL 7	GSFC 4	MSFC 2	LaRC 1	JPL 16/18	GSFC 27/34	MSFC 2
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SMAP	ICESat-2	Disc-12		LADEE	NuSTAR	JWST	SOFIA(1/0)	<i>Strofi</i>	Kepler	<i>Herschel</i>	Fermi	MESSENGER	CALIPSO	GALEX	HST	Chandra
GRACE	GEMS		SAGE III		ST-7	<i>Astro H</i>				<i>Rosetta</i>	SDO	New Horizons		Spitzer	<i>Suzaku</i>	<i>Hinode</i>
FO	<i>Solar Orbiter</i>			OCO-2	LDCM				DAWN	LRO			Planck		Integral	
	Solar Probe +				GPM				Juno	NPP			Cloudsat		XMM	
	OSIRIS-REx				MAVEN				GRAIL				ACRIMsat		SWIFT	
	EX-1				SET-1				MSL				GRACE (2)		Aqua	
	EX-2				RBSP (2)				Aquarius				Jason-1		Aura	
					MMS (4)								OSTM/Jason 2		SORCE	
					IRIS								QuikSCAT		EO-1	
													Voyager (2)		Terra	
													Mars Express		TRMM	
													Mars Odyssey		Landsat 7~	
													MER (1)		ARTEMIS* (2)	
													Cassini		THEMIS (3)	
													MRO		STEREO (2)	
													Deep Impact		AIM	
															Cluster-2 (4)	

SOFIA is a mission project but does not add spacecraft

Italics = US instruments on foreign mission

X / Y = # of missions / # of spacecraft

* New missions two of the THEMIS spacecraft, respectively

~ Operated by another agency

Being reassessed per new Decadal Survey

NOAA Reimbursable:

GOES-R series, Jason-3, JPSS-1&2, DSCOVR

RHESSI SOHO TIMED IBEX
WIND ACE GEOTAIL CINDI
TWINS-A TWINS-B

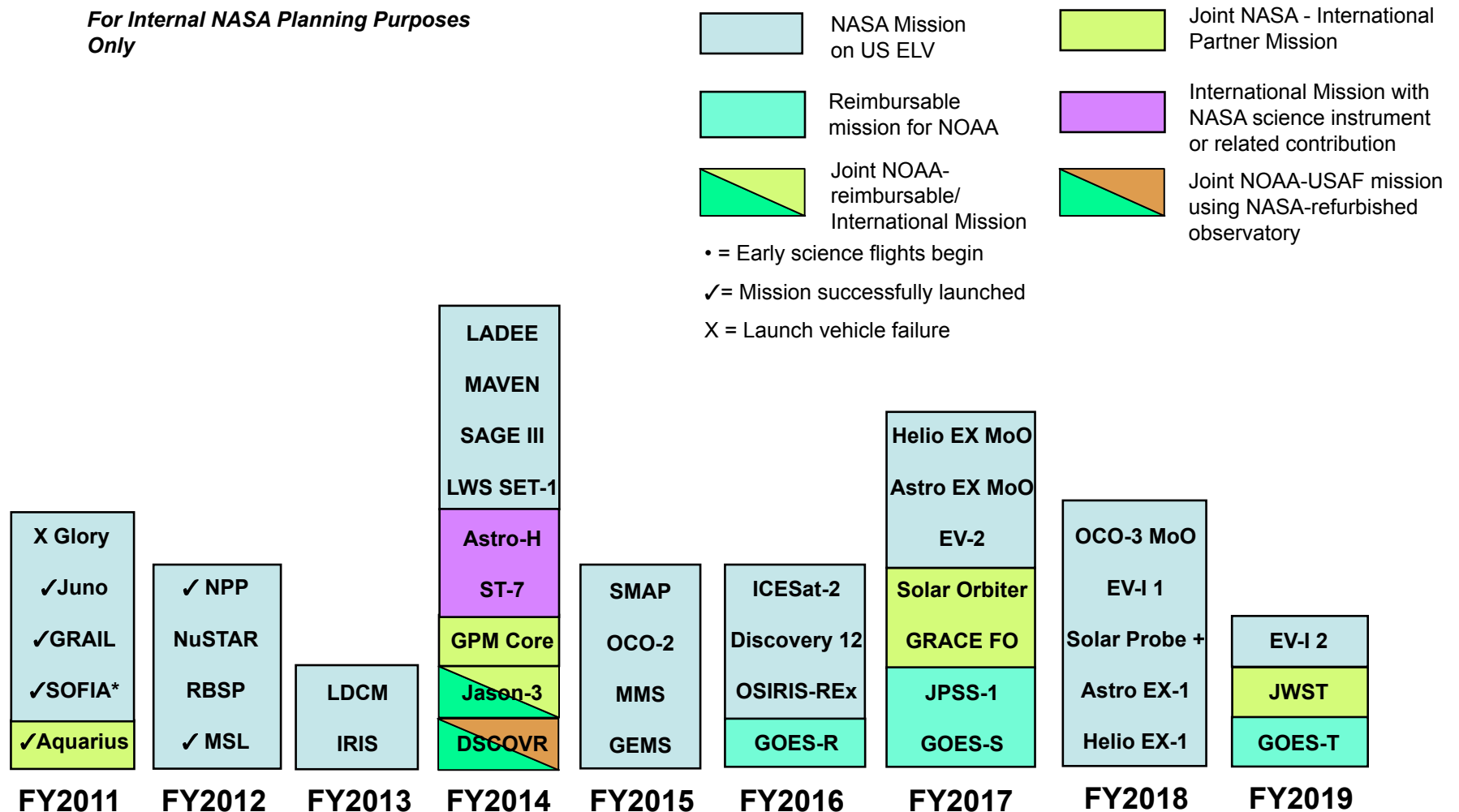
11

NASA Science Missions By Launch Year

(Fiscal Years 2011-19 – FY13 Budget Request)

As of 2/13/12

For Internal NASA Planning Purposes
Only



SMD Solicitations

TYPE: NAME OF SOLICITATION	RELEASE DATE	PROPOSAL DUE DATE	TARGET SELECT DATE
<u>OPEN SOLICITATIONS</u>			
NRA: RESEARCH OPPORTUNITIES IN SPACE AND EARTH SCIENCES – 2011 (ROSES-2011) NNH11ZDA001N 38 Amendments (as of 1/24/12) 64 due dates (51 have passed) + 1 rolling	2/18/11	4/30/11 thru 4/30/12	Goal: ≤ 150 d after due date
CAN: NASA Astrobiology Institute – Cycle 6 NNH12ZDA002C	10/11/11	2/15/12	Summer 2012
Downselect: Discovery 2010	7/1/11	4/2/12	Fall 2012
Downselect: Explorer 2011 and Missions of Opportunity	10/18/11	9/21/12	February 2013
AO: Second Stand Alone Mission of Opportunity Notice II (SALMON-2) Co-issued with HEOMD and OCT NNH12ZDA006O	2/7/12	N/A	N/A
AO: ESSP Earth Venture – Instruments (PEA for SALMON-2) NNH12ZDA006O-EVI1	2/7/12	5/8/12	Early 2013
NRA: RESEARCH OPPORTUNITIES IN SPACE AND EARTH SCIENCES – 2012 (ROSES-2012) NNH12ZDA001N	2/14/12	5/1/12 thru 4/30/13	Goal: ≤ 150 d after due date
<u>CLOSED SOLICITATIONS</u>			
AO: ESSP Earth Venture – 2: Small Missions NNH11ZDA012O	6/17/11	9/29/11	April 2012
AO: SOFIA Second Generation Instruments (PEA for SALMON) NNH08ZDA009O-SOFIA2G	7/8/11	10/7/11	March 2012

<http://soma.larc.nasa.gov/StandardAO/>

Tentative Future Mission Opportunities

(Based on Notional Outyear Budgets)

Future Astrophysics and Heliophysics Explorer Mission Selections:

Spring 2013 Step 2 Explorer selection and MoO (current AO)

TBD Next AO released – Timing dependent on whether solicitation is for a mission of opportunity (AO in late 2012) or mission (AO in early 2014)

Future Discovery Mission Selections:

Summer 2012 Discovery 12, for launch NLT 2016 (current AO)

2015 Discovery 13, for launch ~2020

Future New Frontiers Mission Selections:

2016 New Frontiers 4, for launch ~2023

Future Venture Class Mission Selections:

2012 EV-2 orbital, for launch ~2017; every 4 years thereafter (current AO)

2012 EV-I1 instruments, for delivery ~2016; every ~15-18 mos thereafter (current AO)

2014 EV-3 suborbital; every 4 years thereafter

Future Solar Terrestrial Probes Mission Selections:

2015 Step 1 STP#5 selection

Heliophysics Division Budget Overview

Overarching Goal: Understand the Sun and its interactions with the Earth and the solar system

Major activities:

- **Building, launching, and operating** a series of large, medium, and small missions as a system observatory, many with international partners.
- **Developing technologies** to enable future space weather missions.
- **Conducting and sponsoring cutting-edge research**, enabling research, technology, and workforce development
 - **Suborbital-class projects** using sounding rockets, scientific balloons, and other platforms.
 - **Analysis of data** from NASA and international partner space observatories.
 - **Theoretical and computational investigations.**
- **Education and outreach** that leverage Heliophysics discoveries and missions to increase STEM capabilities

Significant interagency and international interactions are required:

- Important supplier of data and models to international Space Weather community.
- Key leadership role in National Space Weather Council

Heliophysics Budget Features

What Changed:

- Covers increased launch vehicle costs
- Modest investment in Sounding Rocket Sustainer Motor design activity.

What's the Same:

- Fully funds missions in formulation/development: RBSP/ BARREL, IRIS, MMS, SOC, SPP.
- Continues support for 16 operating missions (Voyager, Wind, ACE, TIMED, RHESSI, STEREO, THEMIS/ARTEMIS, AIM, IBEX, SDO; *Partnerships*: Geotail, SOHO, Cluster, Hinode; *MO*: TWINS, CINDI).
- Maintains Supporting Research and Suborbital Program

Heliophysics Program Content

	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	FY 17
				<i>(FY14-17 estimates are notional)</i>			
Heliophysics	634.1	620.2	643.7	643.0	633.2	638.3	661.6
<u>Heliophysics Research</u>	<u>160.8</u>	<u>175.2</u>	<u>178.9</u>	<u>162.6</u>	<u>168.5</u>	<u>170.3</u>	<u>171.6</u>
Heliophysics Research and Analysis	34.0	32.9	32.7	31.0	31.5	31.5	31.5
Sounding Rockets	45.9	52.3	56.1	51.6	56.3	53.0	53.0
Research Range	19.5	20.1	20.5	21.0	21.3	21.6	21.7
<u>Other Missions and Data Analysis</u>	<u>61.4</u>	<u>69.9</u>	<u>69.6</u>	<u>58.9</u>	<u>59.5</u>	<u>64.2</u>	<u>65.5</u>
Voyager	4.4	5.3	5.3	5.4	5.4	5.5	5.5
ACE	3.4	3.7	3.7	3.7	3.7	3.8	3.8
SOHO	1.9	2.0	2.1	2.2	1.9	1.9	1.9
WIND	2.1	2.0	2.1	2.2	2.2	2.2	2.2
RHESSI	1.7	1.9	2.0	2.1	2.0	2.1	2.1
CLUSTER-II	2.1	1.5	1.2	0.8			
TIMED	3.0	3.0	2.8				
GEOTAIL	0.3	0.2	0.2				
TRACE	0.3						
SOLAR Data Center	1.0	0.7	0.8	0.8	0.8	0.9	0.9
SEC Data & Modeling Services	3.8	3.7	3.7	3.7	3.8	3.8	3.9
Space Physics Data Archive	1.4	1.4	1.3	1.3	1.3	1.4	1.4
SEC Guest Investigator Program	11.3	10.4	12.1	11.9	10.5	13.8	13.8
CCMC	1.8	2.0	2.0	1.8	1.8	1.8	1.8
Science Data & Computing	4.8	2.8	4.2	4.0	4.2	4.4	4.4
SSC MO Services	9.9	10.1	10.7	11.0	11.3	11.6	11.7
Directed Research & Technology		13.5	11.9	4.4	6.9	7.4	8.4
Science Planning and Research Support	5.2	5.7	3.5	3.6	3.7	3.7	3.8
GSFC Building Support	3.0						

Heliophysics Program Content (cont'd)

	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	FY 17
				<i>(FY14-17 estimates are notional)</i>			
<u>Living with a Star</u>	<u>213.4</u>	<u>196.0</u>	<u>229.2</u>	<u>212.2</u>	<u>282.7</u>	<u>336.6</u>	<u>351.7</u>
Radiation Belt Storm Probes (RBSP)	146.1	86.1	37.7	14.5	9.1		
Solar Probe Plus	13.9	49.5	112.1	103.2	137.1	229.3	215.2
Solar Orbiter Collaboration	8.3	21.3	21.3	58.2	102.1	75.6	100.0
<u>Other Missions and Data Analysis</u>	<u>45.1</u>	<u>39.0</u>	<u>58.2</u>	<u>36.3</u>	<u>34.3</u>	<u>31.8</u>	<u>36.5</u>
Solar Dynamics Observatory (SDO)	21.8	15.1	16.3	14.2	9.6	9.6	9.7
BARREL	1.6	1.6	1.9	1.5	0.3		
LWS Space Environment Testbeds	0.4	0.5	0.4				
LWS Science	17.0	15.0	19.8	17.5	17.5	19.8	20.8
LWS Program Management and Future Missions	4.4	6.8	19.8	3.1	6.9	2.4	6.0
 <u>Solar Terrestrial Probes</u>	 <u>168.3</u>	 <u>188.7</u>	 <u>189.4</u>	 <u>179.8</u>	 <u>64.5</u>	 <u>46.7</u>	 <u>53.4</u>
Magnetospheric Multiscale (MMS)	150.8	170.3	168.3	157.6	42.9	20.4	12.5
<u>Other Missions and Data Analysis</u>	<u>17.4</u>	<u>18.5</u>	<u>21.1</u>	<u>22.2</u>	<u>21.6</u>	<u>26.3</u>	<u>40.9</u>
Solar Terrestrial Relations Observatory (STEREO)	8.2	9.0	8.5	9.6	9.6	9.7	9.7
Hinode (Solar B)	8.0	8.2	8.2	8.4	8.4	8.5	8.6
STP Program Management and Future Missions	1.2	1.4	4.4	4.1	3.5	8.0	22.6

Heliophysics Program Content (cont'd)

	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	FY 17
				(FY14-17 estimates are notional)			
<u>Heliophysics Explorer Program</u>	<u>91.7</u>	<u>60.2</u>	<u>46.1</u>	<u>88.4</u>	<u>117.5</u>	<u>84.8</u>	<u>84.8</u>
IRIS	63.5	39.1	12.1	7.3	1.2		
<u>Other Missions and Data Analysis</u>	<u>28.1</u>	<u>21.1</u>	<u>34.0</u>	<u>81.1</u>	<u>116.3</u>	<u>84.8</u>	<u>84.8</u>
Explorer Future Missions		3.8	14.9	63.5	101.0	65.5	65.6
THEMIS	10.9	6.0	4.4	4.6	3.0	5.2	5.2
Aeronomy of Ice in Mesosphere (AIM)	3.5	3.0	3.0	3.1	3.0	3.0	3.0
Interstellar Boundary Explorer (IBEX)	1.5	1.6	4.0	2.5	2.5	4.0	4.0
TWINS	1.0	1.0	1.0	0.6	0.6	0.6	0.6
CINDI	1.3	1.0	0.8	0.8	0.1		
Explorer Management	10.1	4.7	6.0	6.2	6.2	6.4	6.4
<u>New Millennium</u>	<u>0.1</u>						
Space Technology 7 (ST7)	0.1						

Heliophysics FY12 and FY13 Planned Accomplishments

- Launch of the Radiation Belt Storm Probes (RBSP), IRIS, and the first BARREL balloon campaign.
- MMS will complete Systems Integration Review and start integration and test.
- Solar Orbiter and Solar Probe Plus missions will retire technology development risks before moving from formulation into development.
- Selection of the next Heliophysics Explorer.
 - Develop replacement sounding rocket sustainer motor design, releasing to industry for manufacture. Program to support the launch of ~20 rockets.
 - Conduct Senior Review of Heliophysics Missions, issuing instructions for an in-guide program to support the Heliophysics Systems Observatory.
 - Receive NRC Decadal Survey and conduct strategic planning activities for in-guide deployment of highest priority recommendations.

Sounding Rocket Program

▪ Black Brant motors

- Biannual technical meeting with Bristol, NSROC, SRPO reviewed technical status and production schedule.
- Current inventory exhaustion anticipated Sept 2012; but Bristol has received new 4140 casings early; first motor of new production run may become available as early as Nov 2012.

▪ Supplier for graphite used in nozzles no longer making product.

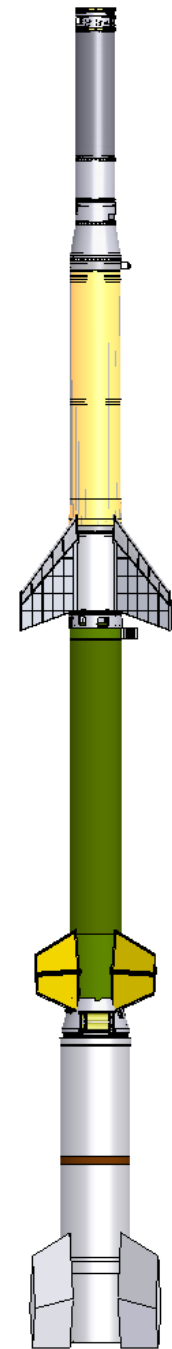
- Will affect both Brant and Oriole motors, beginning in 2013.
- Bristol has already begun procuring samples from other graphite suppliers to implement a testing program to select a new type of graphite

▪ Oriole motors

- 6 motors purchased, 3 delivered to Wallops.
- Planned use in 4-stage geospace missions in 2013 Poker campaign requires Talos-Taurus-Oriole development and flight test (Aug 2012)

▪ Peregrine motor design project

- Still working commitment for \$1.8M shortfall with OCT and OCE.
 - OCT DPMC is currently scheduled for March 7.
- SRPO completing Project Plan and actions from January 5 review.



Talos-Terrier-Oriole-
Nihka w/o payload

Sounding Rocket Program Risks

▪ Poker Flat Environmental Assessment

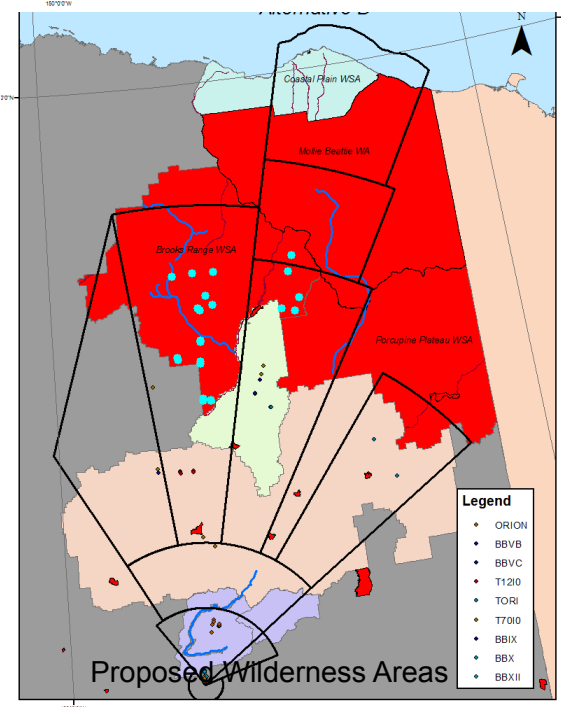
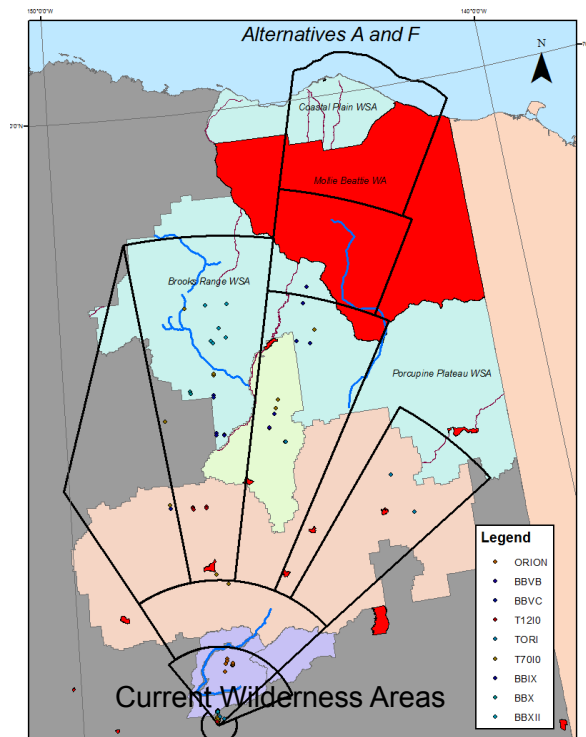
- Public concerns raised in 2008 regarding rocket 'debris'
- Full environmental impact assessment study in progress; to be released for public comment summer 2012.
- Arctic Refuge Conservation Plan: Large swaths proposed for 'wilderness' designation; current protocol prohibits planning impacts within wilderness area
 - After sending comment & objection letters, we are now included as a formal "Cooperating Agency." NASA's collaboration has been welcomed; encouraging proposals for creative solutions that both conservation and NASA objectives can co-exist; recommendation due this spring.

▪ NiCad Batteries

- Used in payloads and in FTS.
- Alternative battery supplier found for payloads; delivery recently delayed from February to March; not expected to have an immediate impact on missions.
- Replacement cells for FTS (will also support payloads) also on order (require additional qualification) will arrive NET Sept 2012.
- Longterm solution will be lithium-ion batteries, to be ordered this month.

▪ FTS Ordnance Kits

- Existing ordnance kits available, but WSMR Flight Safety must agree to extend shelf-life qualifications.
- New ordnance kits are on order; delivery expected in March 2013



Sounding Rocket Program

Upcoming Missions

- Cosmic Infrared Background Experiment (**CIBER**) from WSMR, Feb 24 (PI: Bock/JPL)
- Focusing Optics X-ray Solar Imager (**FOXSI**) from WSMR, March (PI: Krucker/Berkeley)
- Anomalous Transport in the Lower Thermosphere (**ATREX**), a 5-rocket mission from WFF in March (PI: Larsen/Clemson)
- Venus Spectral Rocket (**VeSpR**) from WSMR, March (PI: Clarke/Boston U)

Sounding Rocket Working Group met at WFF Jan 26-27. PI's are providing assistance in defining science impacts of Arctic Conservation Plan proposals.

NASA's Magnetosphere-Ionosphere Coupling in the Alfvén Resonator (MICA) sounding rocket launched into an active aurora at 05:41:07 GMT February 19 from Poker Flat, Alaska



- MICA answers the question “does the ionosphere play an active role in the origin and evolution of auroral arcs”. Launch window opened Monday, February 13; aurora monitored nightly for appropriate conditions. Launch occurred on the 7th night.

- Observational evidence from prior missions and theoretical work indicates that the ionosphere can be actively involved in the formation and evolution of auroral arcs. This investigation, includes measurements plasma density variations not obtained on prior missions. MICA is likely to lead to important new insights on the role of the ionosphere once the data has been fully analyzed.

- No issue with launch – tracking, recorders, and readout displays functioned nominally. The sub-payload performed exceptionally; the wire booms deployed as expected. The main payload experienced an anomaly on the deployment of the forward booms. The ACS performed well, overcoming coning from the Brant burn. Aligned to the B field with a good tight alignment for the whole flight. No safety issues. No issues on the PFRR Range. PI, Steve Powell thanked everyone at Poker and at WFF for the hard work which led to success (preliminary indications are comprehensive success).



Top left: Photo of aurora taken shortly before rocket launch; Top right: Launch photo, both by NASA photographer Terry E. Zaperach. Bottom: From Spaceweather.com submission by an observer.

Unified Space Weather Capability

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
UNITED STATES AIR FORCE
OF THE
U.S. DEPARTMENT OF DEFENSE
THE U.S. GEOLOGICAL SURVEY
OF THE
U.S. DEPARTMENT OF THE INTERIOR
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
THE NATIONAL SCIENCE FOUNDATION
AND THE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
OF THE
U.S. DEPARTMENT OF COMMERCE

**To Coordinate and Cooperate in Activities Involving the Development and Execution of a
Unified Space Weather Capability**

Article I. Parties

A The Parties and their affiliation with the National Space Weather Program (NSWP) are

Unified Space Weather Capability

Article III. Purpose

This MOU serves as an umbrella agreement that sets forth the general terms and conditions under which the Parties will coordinate and cooperate in activities to improve space weather science and services, and is consistent with the 2010 National Space Policy guidance to strengthen interagency partnerships.

This MOU is designed to facilitate efforts by the Parties' scientists, administrators, and engineers to work together; achieve mutual goals; and leverage resources for sharing information and for planning, developing, and implementing science and services in support of space weather forecasting.

It is also intended to serve as the foundation and mechanism for global agencies to enlist the involvement of the Parties in addressing global space weather needs. Since the UNSWC is intended to encompass the key space weather services and supporting research provided by the United States Federal Government, it can effectively serve as a point of international engagement and cooperation.

DRAFT LANGUAGE

In closing ...

- Explorer Concept Study Reports due to NASA at end of September, Review begins for downselect in Spring 2013.

Items you'll hear about from our team members ...

- Heliophysics Data Policy update
- Changes to Program Elements in ROSES 2012
- National Research Council release of Decadal Survey and plans for Heliophysics Division response
- NASA Space Radiation Working Group